

Johnson Controls Interiors
GmbH & Co. KG / Grefrath
File ref.: 04216/WO

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**Method for producing a heterogeneous, in particular
multicolored, sheet-like structure, mold and sheet-like
structure**

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Description

The invention relates to a method for producing a
heterogeneous, in particular multicolored, sheet-like
15 structure, for example a decorative skin for an
interior trim part of a vehicle, and to molds suitable
for this purpose and to sheet-like structures produced
thereby.

20 **Prior art**

Patent application DE 102 11 663 A1 discloses a method
for producing a heterogeneous, but one-piece, molded
part, which consists in certain regions of a hard,
25 thermoplastic material, for example polypropylene (PP)
or a PP compound, and an elastically deformable
material, for example an olefin-based thermoplastic
elastomer. The first and second segments of the molded
part are produced in separate molds and subsequently
30 joined to form a unit by molding on a connecting
segment.

This method is suitable for producing small molded
parts of complex geometry and high-value appearance,
35 but is less suitable for producing large, sheet-like
structural members, in particular decorative skins for
interior trim parts, on account of the awkward handling
of the extended segments of the structural member.

Problem

The invention is based on the problem of providing a
5 method for producing high-value and heterogeneous, in
particular at least two-colored, sheet-like structures.

Solution

10 The problem is solved according to the invention in the
case of this method by at least a first cavity and a
second cavity of a mold being filled with at least a
first and a second polymer material which are free-
flowing and after removal form a one-piece sheet-like
15 structure, a sealing element being arranged in the
mold, at least during the filling of one cavity, and
extends along the parting plane in relation to the
neighboring cavity.

20 The sealing element achieves the effect of reliable
segmentation of the surface of the one-piece molded
skin in the case of an extended and possibly complexly
shaped longitudinal extent of the parting plane. In
particular in the case of multicolored sheet-like
25 structures, a distinct separation is created between
the adjacent, differently colored surface regions, so
that the molded skin is suitable for use in
particularly demanding application areas of automobile
construction.

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A suitable mold for carrying out the method has at
least a first mold part and a second mold part, which
can be displaced with respect to said first part, which
mold parts form at least a first cavity and a
35 neighboring second cavity, which can be filled with at
least a first and a second free-flowing polymer
material, after the closing of the mold. According to
the invention, a sealing element is arranged along the

parting plane between the first cavity and the second cavity.

5 The following developments of the method can be used with particular advantage when reactively curing polymer materials are used, injected into the cavities by means of an injection-molding process (Reaction Injection Molding (RIM)). These polymers have a particularly low viscosity in the free-flowing state,
10 so that the sealing between the cavities assumes special significance.

According to a first embodiment of the method according to the invention, the sealing element is firmly
15 connected to one mold part, in particular the upper mold, and can be pressed against another mold part, in particular the lower mold. The sealing element is preferably expandable under fluid pressure ("inflatable seal") and can be pressed against a protruding
20 projection of the other mold part, in particular the lower mold.

After the filling of the first cavity with the first polymer material, the sealing element can be lifted off
25 the other mold part and the second cavity filled with the second polymer material, the first and second polymer materials bonding with each other in such a way that they fuse together but appear distinctly separate. The lifting off of the seal preferably takes place by
30 reducing the fluid pressure inside the tube-like seal, it also being possible to set a fluid pressure that lies below the ambient pressure. This creates a lifting-off force which exceeds the elastic recovery of the sealing element.

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In the case of a mold that can be used here, the sealing element is preferably firmly arranged in one mold part, in particular the upper mold, and can be

pressed against the other mold part, in particular the lower mold, in an expandable manner under fluid pressure.

5 According to another embodiment of the invention, before the filling of the cavities, the sealing element is loosely placed into one mold part, in particular the upper mold, in the region of the parting plane, and, during the closing of the mold, is made to bear in a
10 sealing manner against the other mold part, in particular the lower mold.

The sealing element can advantageously be pressed against a protruding projection of the other mold part,
15 in particular the lower mold, and, during the filling of the cavities, bonds with the first polymer material on the one hand and the second polymer material on the other hand in such a way that they fuse together. The sealing element is therefore lost in the production of
20 the molded skin and must be replaced by a new sealing element before renewed filling of the cavities.

In the case of a suitable mold, the sealing element can be loosely placed into one mold part, in particular the
25 upper mold, and can be pressed against the other mold part, in particular the lower mold.

Figures

30 The figures present various embodiments of the invention schematically and by way of example.

Figures 1a-e show how a first method according to the invention is carried out using a first
35 mold suitable for this purpose,

Figures 2a-e shows a mold and a method according to another development of the invention.

The mold 1 shown in Figures 1a to 1d comprises a first mold part 2 in the form of the upper mold 3 and a lower mold 4, forming a second mold part 2'. The upper mold 3 and the lower mold 4 can be displaced in relation to each other and, in their position for use as shown in Figure 1a, form a first cavity 5 and a second cavity 5'. The cavities, extending in a two-dimensional manner, can be filled with different free-flowing polymer materials by means of injection-molding units (not shown) and are suitable for the production of sheet-like structures which have a very small thickness in relation to their length and width. The cavities do not have to be formed in a planar manner, but may also have a curved profile for the production of complexly shaped decorative skins.

The upper mold 3 is provided along the parting plane 6 between the neighboring cavities 5, 5' with a tubular sealing element 7, the hollow space 8 of which can be filled with a compressed gas after the closing of the mold parts 2, 2'. The sealing element 7 is firmly connected to the mold upper part 3 by means of a securing means 10, which can be fixed by screws 9. As a result of the positive pressure, the sealing element 7, the longitudinal extent of which may likewise have a complex profile, expands elastically and comes to lie in a sealing manner against a projection 11 protruding from the lower mold 4. Subsequently, as can be seen from Figure 1b, the first cavity 5 is filled with a low-viscosity first polymer material 12, which is gray for example, is prevented by the sealing element 7 from passing over into the second cavity 5' and cures in the first cavity 5 as the result of a chemical reaction.

Subsequently, the hollow space 8 of the sealing element 7 is subjected to negative pressure, so that the sealing element 7 lifts off from the projection 11

(Figure 1c). The second polymer material 12', which is subsequently injected into the second cavity 5' and is black for example, penetrates as far as the first polymer material 12 and bonds with it during the reactive curing in such a way that they fuse together. After the opening of the mold 1 (Figure 1f), the two-colored sheet-like structure 13 obtained in this way can be removed.

10 The mold as shown in Figure 2a, intended for carrying out another method according to the invention, likewise has two mold parts 2, 2' in the form of an upper mold 3 and a lower mold 4, the lower mold 4 likewise being provided with a projection 11. On its side facing the projection 11, the upper mold is provided with a
15 groove-like receptacle 14 for the clamping, but releasable, securement of an elastic sealing element 7 in the form of a strand (Figure 2b).

20 After the closing of the mold 1 (Figure 2c), the two cavities 5, 5', neighboring but separated by the sealing element, are filled with differently colored, free-flowing polymer materials 12, 12', which penetrate as far as the sealing element and bond with the latter
25 in such a way that they fuse together (Figure 2d).

As shown in Figure 2e, after the curing of the polymer materials 12, 12' and the opening of the mold 1, the one-piece sheet-like structure 13 including the lost
30 sealing element 7 can be removed. Apart from the colors of the first and second polymer materials 12, 12', the sheet-like structure 13 may of course have another color, determined by the sealing element 7, in the region of the parting plane 6.

Designations

- 1 mold
- 2 mold part
- 3 upper mold
- 4 lower mold
- 5 cavity
- 6 parting plane
- 7 sealing element
- 8 hollow space
- 9 screw
- 10 securing means
- 11 projection
- 12 polymer material
- 13 sheet-like structure
- 14 receptacle